CNG FUEL SYSTEM SUPPLEMENT (2)

CONTROL PANEL & OPERATIONAL PROCEDURES

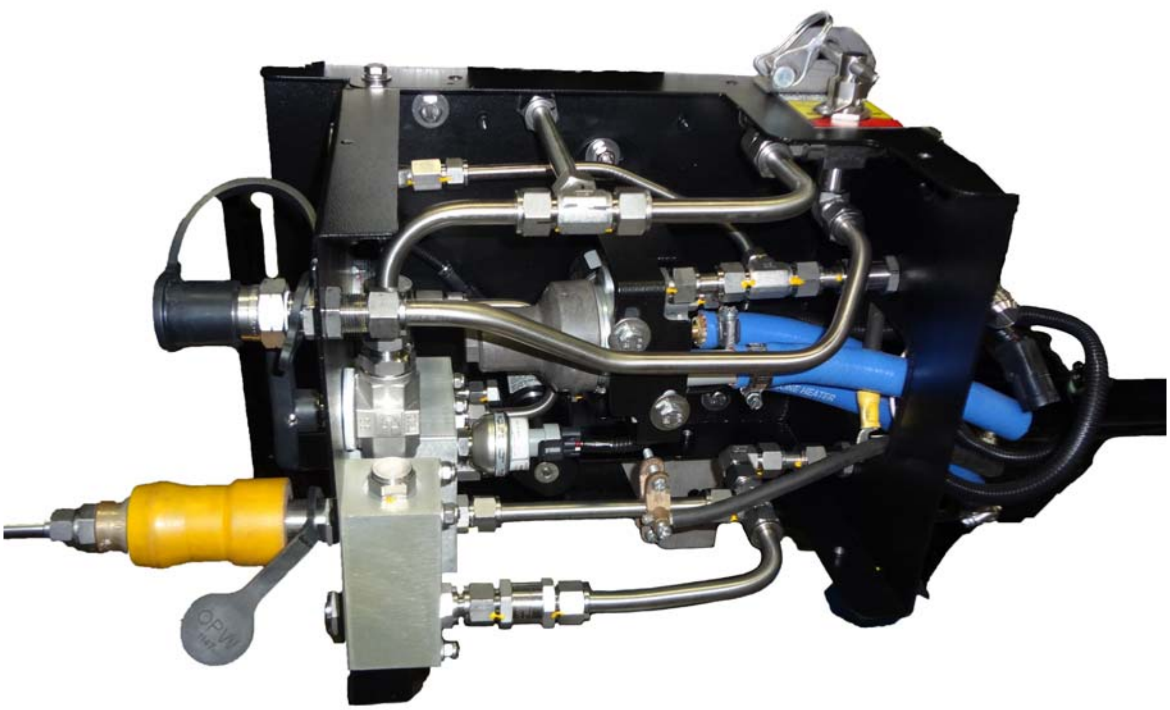


Labrie Enviroquip Group

NATURAL GAS VEHICLE

CNG FUEL SYSTEM SUPPLEMENT (2)

(FOR LABRIE UNITS)



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May 2018

Foreword

This document is the second of a two part series focusing on the Labrie CNG System. It also comes as a supplement to Labrie Operator's and Maintenance Manuals. Through the following pages, operators and maintenance personnel will find practical information on how the CNG system works, as well as safety and operational procedures for proper operation of the new Labrie natural gas vehicle (NGV).

We sincerely hope that this document addresses all your questions and concerns about Labrie NGV's.

Any time you have a problem with a Labrie unit, you should contact your vendor first. They should be able to provide you with the proper help that you need, whether it is for parts or technical service.

FIRST THINGS FIRST:

Do not forget to complete the owner registration form and to send it to Labrie Enviroquip Group. Make sure to fill out the in-service date. This date will be used to start the warranty period. Otherwise, the date of delivery from the factory will be used.

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1

Introduction

This manual is focusing on the safety and operations of the CNG fuel system as well as the Labrie CNG control panel.

IMPORTANT: Read and understand this manual before operating the Labrie CNG control panel.

NOTE: This manual should be kept readily available for easy reference.

Labrie Enviroquip Group has been a leader in the refuse and recycling collection industry for so many years. Our product platforms are recognized to be the most efficient, productive, and innovative in the solid waste industry.

Throughout our history, we have been and remain committed to the design and manufacture of safer, smarter and more efficient waste collection vehicles.

Now there is a cleaner way of collecting waste and recycling materials: CNG fuel powered vehicles.

At Labrie, we are manufacturing more and more CNG fuel powered vehicles than never before. With the high volatility of diesel prices, fuel choice has never been so important. That is why CNG fuel powered vehicles are becoming so popular. And the advantages are so huge: fuel costs per gallon are lower than diesel; CNG produces 23% less greenhouse gas emissions compared to diesel fuel; with CNG, you are less dependant on foreign fuel; and trucks equipped with a CNG fuel system are quieter that those using diesel fuel. In fact, they are 10% quieter.

And to continue our tradition of providing and producing cutting edge waste collection vehicles, all of our CNG fuel powered units are now equipped with our own CNG control panel.

The Labrie CNG control panel has been designed to perfectly fit into the CNG system that is provided with your vehicle.

CNG

Main Components of the CNG Fuel System

The CNG fuel system that is installed on your Natural-Gas Vehicle or NGV is comprised of the following components:

- Storage tanks (or cylinders, canisters, containers)

  These tanks may be placed either on the body rooftop or stacked behind the cab. They may also be placed either alongside the chassis frame or inside the tailgate. Their dimensions vary according to the volume of gas that can be stored inside.
- Integrated gas control system

  This control system is used for supplying gas to the engine.
- Pipes

  Pipes are used to connect the gas supply to the engine.
- Control panel

  The control panel is used for regulating the flow of gas to the engine.
- Fueling receptacle/nozzle

  This component is used for pressurized refueling of the truck.
- De-fueling system

  This system is used to partially or fully de-fuel the CNG system aboard the truck.

CAUTION! Always check the tank expiry date located on the control panel before refueling the truck.

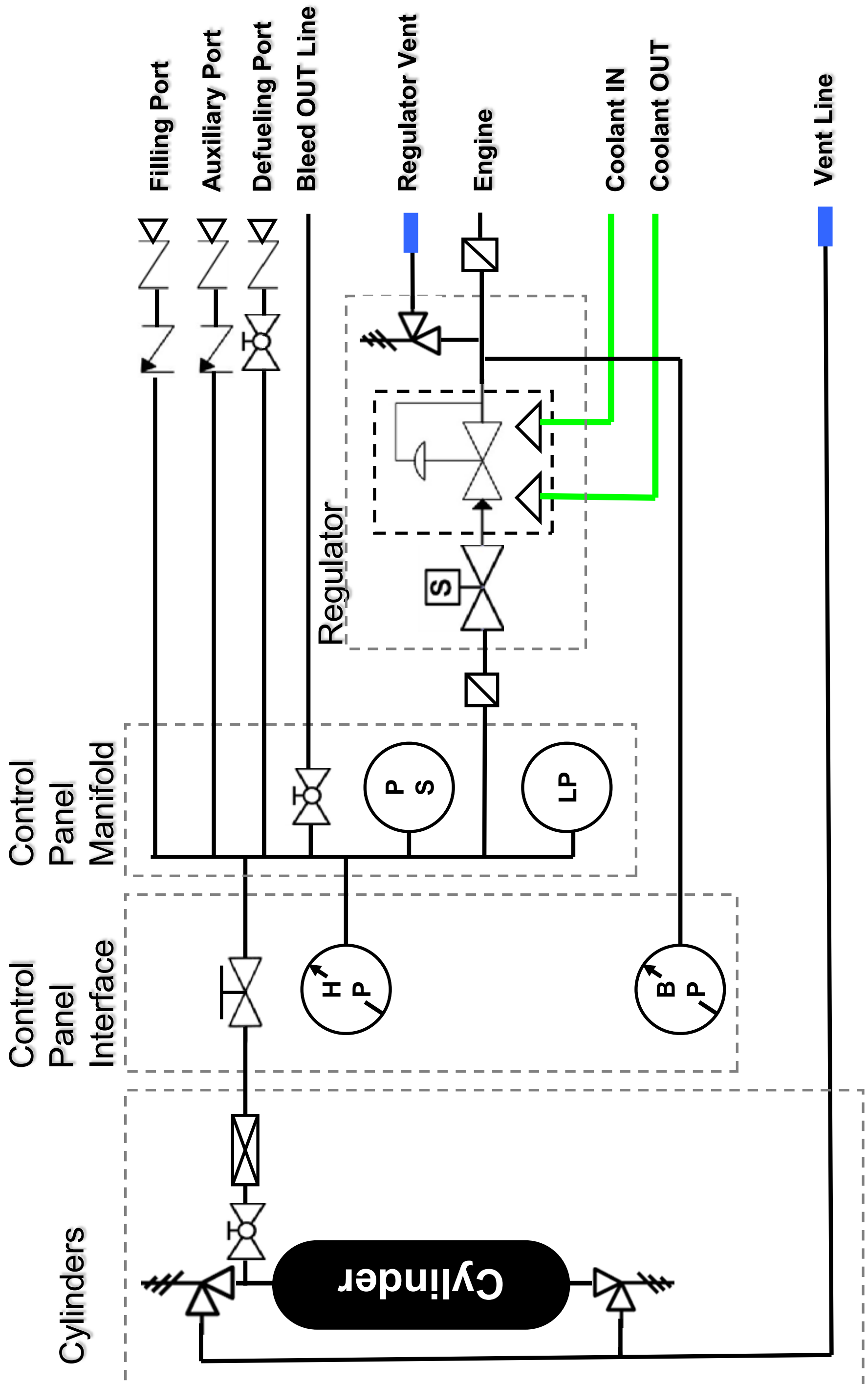
For a brief description of a typical CNG fuel system setup, refer to the *CNG Fuel System Supplement (1) - Safety and Maintenance Procedures.*

System Basic Principles

The control panel will supply CNG fuel to the engine when the solenoid valve, located inside the control panel, is activated and the storage tank valves and the manual shut-off valve are in their open position.

When the solenoid valve is activated, high pressure CNG fuel flows from the tanks to the engine via the manual shut-off valve, manifold, coalescing filter, and pressure regulator.

CNG Fuel System - General Schematic



To Contact Labrie Plus

In the U.S.

Address:	1198 Shattuck Industrial Blvd.
	LaFayette, GA 30728
Toll Free:	1-800-231-2771
Telephone:	1-920-233-2770
General Fax:	1-920-232-2496
Sales Fax:	1-920-232-2498
Parts and warranty:	During business hours, 8:00 AM to 6:00 PM Eastern Standard Time
Technical Support Service:	Available 24 hours

In Canada

Address:	175A Route Marie-Victorin
	Levis, QC G7A 2T3
Toll Free:	1-877-831-8250
Telephone:	1-418-831-8250
Service Fax:	1-418-831-1673
Parts Fax:	1-418-831-7561
Parts and warranty:	During business hours, 8:00 AM to 5:00 PM Eastern Standard Time
Technical Support Service:	Available 24 hours
Website:	www.labriegroup.com
E-mail:	sales@labriegroup.com

IMPORTANT: For technical support and parts ordering, the serial number of your vehicle is required. Therefore, Labrie Enviroquip Group recommends to keep record of the information found on the VIN plate, which is located in the cab.

2

Safety and Operational Precautions

DANGER, WARNING, CAUTION notations appear throughout this manual and on decals placed on and inside the vehicle.

Conventions

DANGER!	Indicates a hazardous situation which, if not avoided, ***will*** result in serious injury or death.
WARNING!	Indicates a hazardous situation which, if not avoided, ***could*** result in serious injury or death.
CAUTION!	Indicates a hazardous situation which, if not avoided, could result in ***minor or moderate injury.***

Other Words of Warning

The words *Notes* and *Important* also appear in this manual and precede information which are vital to the proper operation and maintenance of your natural-gas vehicle (NGV).

Basic Safety Notions

Despite our efforts to build a vehicle that is as safe as possible, the operator's safety certainly depends on the precautionary measures taken while operating the vehicle. If in doubt about these measures, refer to your supervisor.

Supervisors or Maintenance Department personnel with questions and concerns should contact Labrie*Plus*.

DANGER!

Always be aware of the vehicle's surroundings to make sure that no pedestrians, passersby, bystanders, or other people or vehicles are in any way exposed to any danger caused by the use of this natural-gas vehicle (NGV).

DANGER!

Never get in the hopper area when the engine is running.
Only authorized personnel may do so following a lockout/tagout procedure (see *Locking Out and Tagging Out the Vehicle* on page 11).

Responsibilities

Safety is everybody's responsibility. Both employer and employee must play their part to ensure the safety of the operator, the vehicle, and its immediate surroundings.

Employer's Responsibilities

It is the responsibility of the employer:

- To ensure that the NGV is operated in accordance with all safety requirements and codes established by the authority having jurisdiction (AHJ), including all applicable regulations and standards.
- To ensure that employees are qualified for operating the vehicle and its equipment, and that they all take safety measures before using them.
- To properly maintain all mobile equipment to meet all state/provincial and federal safety standards.
- To supply the operator with adequate knowledge and skills to operate the vehicle and its equipment safely.
- To keep the vehicle maintained and properly adjusted to meet the manufacturer's standards and recommendations. For help or for more information, please contact the manufacturer or any of their authorized representatives.
- To keep records of all vehicle breakdowns and malfunctions, as well as any inspection and maintenance.
- To ensure that all failures or malfunctions that may be affecting the safe use of the vehicle are repaired before the vehicle is put back into operation.
- To meet the appropriate lighting requirements for night shift work (if permitted).
- To regularly accompany the vehicle operator and take measures to ensure the smooth and safe operation of the vehicle.
- To make sure that the backup alarm works properly when the vehicle is in reverse.
- To take necessary measures to correct any damage or malfunction reported by an employee.

- To establish and ensure the application of a “lockout/tagout” procedure (see page 11) any time inspection, repair or maintenance is performed on the vehicle, regardless of whether it takes place on the road or in the garage.

Employee’s Responsibilities

It is the responsibility of the employee:

- To enforce all safety measures to meet the requirements established by the employer.
- To operate this natural-gas vehicle only after having received proper instruction and training.
- To immediately report any damage to or malfunction of the vehicle to the employer or supervisor.
- To make sure that nobody is near the vehicle before activating any of the controls, and to be prepared to stop at any indication of possible danger.

Things to Do

- Inspect the body and all systems at the start of each day.
- Make sure that the area is clear of any people or possible obstructions.

IMPORTANT: Be extremely cautious in areas where small children may be present.

- Wear safety glasses and footwear, gloves, and any other safety equipment when loading and packing refuse.
- Make sure that mirrors, windows, lights, and monitor equipment are clean and properly adjusted.
- Check for explosive trash (televisions, paint cans, fluorescent light tubes, etc.).
- Drive carefully when carrying an unevenly distributed load.
- Inspect for overhead hazards (power lines) prior to hoisting the body or using the arm.
- Use the body safety prop when servicing under the body (if installed).
- Use the tailgate safety prop before entering the area between the main body and the tailgate.
- Obey all warning and operation stickers.

Things to Avoid

- Do not operate any vehicle while under the influence of alcohol, narcotics or other intoxicants.
- Do not talk on a cell phone or listen to loud music while driving.
- Do not wear jewelry or loose clothing.
- Do not leave the vehicle before it is brought to a complete stop and the work or parking brake is engaged.
- Do not enter the hopper or main body unless the engine is shut off, the key is removed and there is an out-of-service tag on the steering wheel. Refer to the lockout/tagout procedure on page 11.
- Do not hoist the body if the vehicle is standing on uneven ground (vehicle equipped with a hoistable body).
- Do not back up the vehicle when the body is raised (vehicle equipped with a hoistable body).

- Do not drive with the tailgate fully open unless it is to unload refuse at the landfill.
- Do not use the body safety prop to prop a *loaded* body (vehicle with a body prop).

Only qualified personnel should service the hydraulic, electrical, pneumatic and CNG fuel systems of this vehicle. They should also be fully versed in operating the vehicle.

General Precautions

DANGER!



Operator and maintenance personnel must adhere to the following precautions *at all times*. Failure to do so may result in vehicle and/or property damage, personal injury, or even death.

- Read and make sure that you fully understand this manual and all safety decals before operating this vehicle. Maintenance personnel must also read and understand the *Maintenance Manual* for this vehicle as well as the maintenance-related information contained in this manual. In case of doubt, ask a supervisor for clarifications.
- Before every work day, inspect the body and packing system, as well as any system that might compromise the safety of the public and/or the operator.
- Verify that the accelerator pedal, steering wheel, mirrors, brakes, and turn signals are in good working order.
- When driving the vehicle, keep both hands on the steering wheel at all times.
- Stop the vehicle completely and put on the parking brake before leaving the driving position.
- When the vehicle is parked, the parking brake *must* be applied.
- Do not operate this vehicle if there are any signs of damage or incomplete repairs.
- Report any doubts that you might have and any safety service requirements regarding this vehicle to a supervisor.
- When removing nylon locknuts, *always* replace them with new ones.
- For any work, such as cleaning and inspection, that has to be done between the body and chassis, *always* use the body safety prop. Also, the vehicle *must* be on level ground.
- Before opening and closing the tailgate(s) and/or raising the body, make sure no one is behind the vehicle.
- Do not get into the hopper compartment or try to repair anything behind the packer when it is moving or when the hydraulic pump is still running. Personnel authorized to get into the hopper *must* first lock out and tag out the vehicle, as required by the employer. For more information, see *Locking Out and Tagging Out the Vehicle* on page 11.
- NEVER stand underneath a raised arm/grabber (if installed). Should a hydraulic component break, such as a hydraulic hose, it may result in personal injury or even death. ALWAYS stand clear of the arm.
- The operator of a natural gas vehicle equipped with an automated arm must be able to stop the motion of the lifting arm at any time in order to prevent injury to surrounding people, damage to property or to the lifting arm itself.

- The operator of a natural gas vehicle equipped with an automated arm shall make sure that people or obstructions are far away from the automated arm before moving it. **Failure to do so may result in unit and/or property damages, personal injury or even death**.
- Natural gas vehicles equipped with an automated arm are primarily designed to be operated by only one worker. If, however, a Labrie's customer elects to operate such equipment with more than one worker, other safety items shall be installed to protect the co-worker from hazardous situations. In such a case, Labrie must be informed of every and all arm-equipped units operated by more than one worker. Labrie will then determine and supply, at the customer's expense, the required safety items to be installed. For more information, please contact Labrie*Plus* at **1-800-231-2771** in the U.S. or **1-877-831-8250** in Canada. **Failure to do so may result in unit and/or property damages, personal injury or even death.**
- *Never, under any circumstances* (maintenance or otherwise), stand underneath a *loaded* body.
- Maximum speed while right-hand driving (if permitted) is 20 mph or 32 km/h.

Also:

- It is the employer's responsibility to ensure that *only* qualified employees operate and maintain this vehicle.

IMPORTANT: For precautions specific to your vehicle, refer to the corresponding Operator and Maintenance Manuals.

Natural Gas Safety Instructions

Apply the following safety instructions at all times:

DANGER!

Do not smoke around a natural gas vehicle or near a natural gas station.

DANGER!

A portable fire extinguisher must be available on the vehicle at all times.

DANGER!

Pressure inside a CNG fuel tank must not exceed 3600 psi @ 70° F (21° C).

DANGER! Maintenance (including refueling) on natural gas vehicles must be carried out by qualified and authorized personnel only.

DANGER! Explosion hazard: Be *very careful* when trying to transfer compressed natural gas from or to another vehicle for refueling.

DANGER! Leak detection: *Do not* start the engine if CNG leak is detected.

DANGER! Leak detection: Avoid any open flame or spark close to the vehicle.

DANGER! Prior to performing any mechanical work on the fuel system, always make sure that the relevant components are evacuated and purged using an inert gas and that they are properly grounded. Related electrical connectors may also be required to be removed.

Welding

DANGER! Remove paint before welding or heating. Do not weld near lines that are pressurized or contain flammable fluids. *Never* weld near the natural gas tanks.

CAUTION! Disconnect all batteries and electronic modules prior to welding on packer body.

Fire

The employer must inform and train all personnel on the measures that must be taken in case of a vehicle and/or loaded body catching fire.

Anytime a loaded vehicle is *brought inside a garage,* fire extinguishers shall be close at hand.

DANGER! Do not perform any repair or maintenance on a vehicle that has not been unloaded.

The employer must also inform employees of an appropriate place to unload the body near the maintenance facility (preferably away from traffic, surface drains, and ditches).

Locking Out and Tagging Out the Vehicle

For any inspection, repair or general maintenance being done on the vehicle, whether on the road or at the shop, it is the employer's responsibility to establish a proper lockout/tagout procedure and see to the application of this procedure.

To lock out and tag out your vehicle:

1. Park the vehicle on safe, level ground and apply the parking brake (see Figure 2-1).

Figure 2-1 Parking brake knob



2. Make sure the body is completely unloaded.
3. Switch OFF the hydraulic pump.
4. If maintenance has to be done downstream of the manual shut-off valve, open the supply control panel on the left-hand side of the truck (see Figure 2-2) and shut off the manual valve (see Figure 2-3). If maintenance has to be done on the fuel lines between the CNG cylinders and the manual shut-off valve, all manual cylinder valves have to be turned OFF (see Figure 2-4).

   Drain the fuel lines prior to working on them.

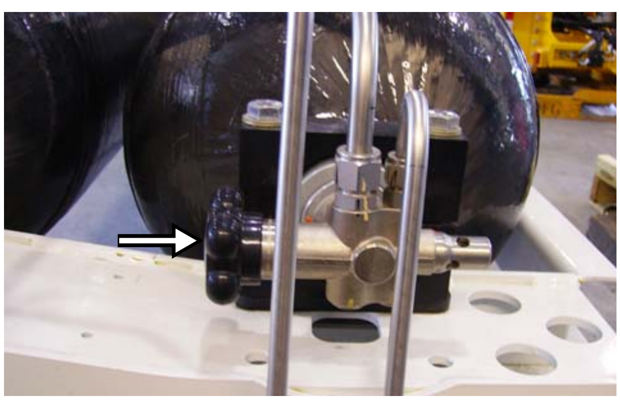
Figure 2-2 CNG supply control panel



Figure 2-3 Manual shut-off valve



Figure 2-4 Manual cylinder valve



5. Let the engine kill, remove the key from the ignition, store it in a safe and controlled area (preferably on yourself), and tape over the ignition switch.
6. Turn OFF and lock the master switch.

IMPORTANT: If the battery set of your vehicle is equipped with a master switch (see Figure 2-5), you must turn it OFF.

Figure 2-5 Master switch



7. Chock all wheels.
8. Put an "OFF SERVICE" tag on the driver's wheel and on the front windshield.
9. Use safety props to block any system that could move by gravity (open tailgate, etc.).
10. Drain all air tanks (see Figure 2-6).
11. Verify and inspect any security device and/or mechanism to make sure that there is no bypass and that they are all functional.

Shutting Down the Vehicle

If the vehicle has to be stored for an extended period of time, follow the chassis manufacturer's shutdown and maintenance requirements.

Also:

1. Park the vehicle on a hard, level surface and apply the parking brake.
2. Make sure that all moving parts are in their home position (tailgate, arm, body, crusher panel, packer, etc.).
3. Turn OFF, in sequence, the hydraulic pump, the electrical system, the CNG shut-off valve, the engine, and (if installed) the master switch.
4. Drain all air tanks and water trap (see Figure 2-6).

Figure 2-6 Drain valve on air tank (left) and water trap (right)



Prior to Start-Up

Before starting the vehicle:

1. Make sure that no system will engage and/or start to operate as you start the engine.
   - **1 a.** Turn OFF all electrical components.
   - **1 b.** Disengage the hydraulic pump.

Figure 2-7 Hydraulic pump ON/OFF switch w/ indicator light (in vehicles not equipped w/ a multiplexed system)



Figure 2-8 Hydraulic pump ON/OFF switch (in vehicles equipped with a multiplexed system)



2. Make sure that the main valve (ball valve) on the hydraulic tank is fully open before starting the vehicle (see Figure 2-9).

NOTE: The hydraulic tank model can vary according to the options installed on the vehicle.

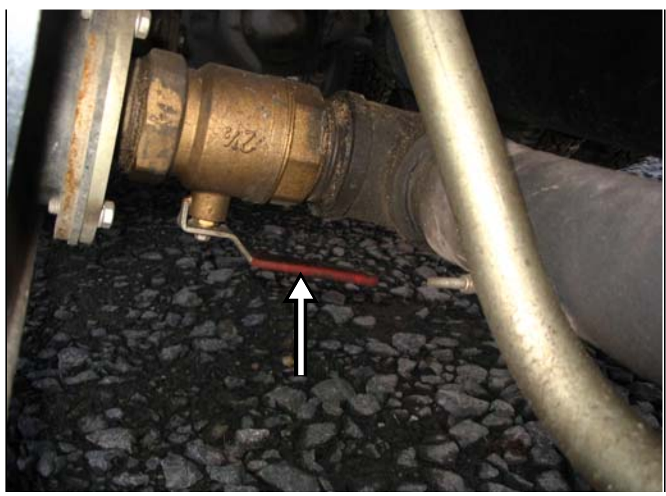
WARNING! Failure to fully open the main valve will cause immediate damage to the pump, even if the pump is turned off.

3. Engage the hydraulic system as explained in the *Operator's Manual* of your vehicle.

   Once the engine is started, wait for the air pressure to build up to *at least* 70 psi.

IMPORTANT: Do not operate or move the vehicle until the air pressure has reached 70 psi.

Figure 2-9 Suction line mounted valve (ball valve)



Starter Interlock (optional)

A CNG starter interlock may be installed on your truck. This interlock is used to prevent your truck from starting when it is still connected to a CNG refill station through one of its refill receptacle. This safety feature disables the starter system. If you turn the ignition key and nothing happens, this may be due to this safety feature. The engine will not crank unless you disconnect the refill hose from the refill receptacle (see Figure 2-10) and the cap is tightly plugged back in said receptacle.

At the heart of the starter interlock system lies a component: the CHC00504 interlock. This system is activated when the spring-loaded cap (see Figure 2-10) is unplugged. A wire (see Figure 2-10) that is attached to said cap is connected to the interlock ground, ensuring the truck will not start.

For you to be able to start the truck, you will have to:

- disconnect the CNG refill hose from the CNG refill receptacle.

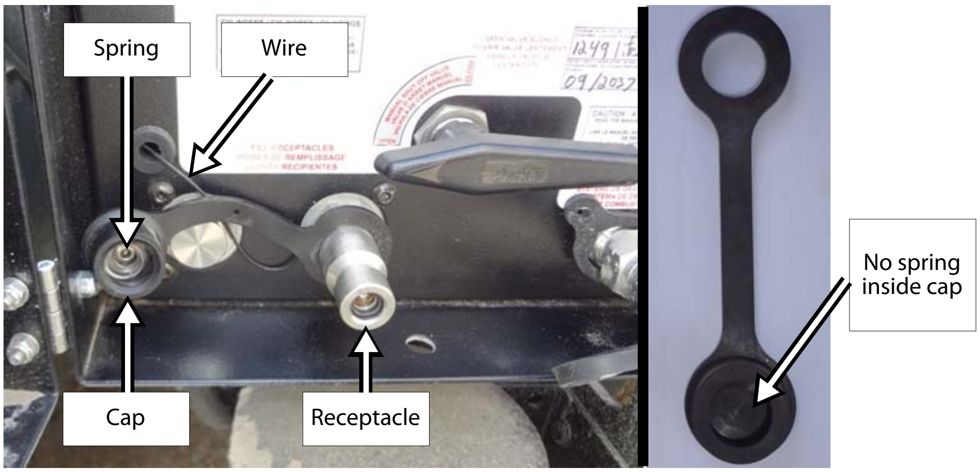
Your truck may be equipped with one or two refill receptacles (one on the front bumper [next to the CNG sticker], the other on the control panel interface).

- plug the spring-loaded cap in the refill receptacle.

  Once done turn the ignition key. The engine should start normally.

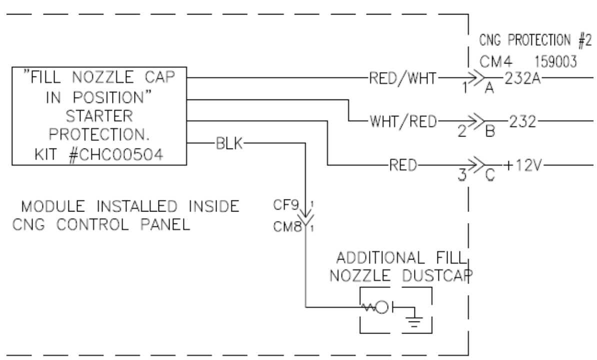
  The spring inside the cap (see Figure 2-10) deactivates the starter interlock.

Figure 2-10 Fill nozzle cap with/without spring inside



The following is a schematic that shows the connections between the interlock system and the starter system. Please note that this schematic is given as an example. If you want something more specific to your truck, use the schematic that is provided with the unit or call your Labrie service representative for more details.

Figure 2-11 Electrical schematic - Starter interlock



3

CNG Control Panel

The CNG control panel (aka control module or fill panel) is part of the CNG fuel system. It is designed to meet all required safety and vehicle standards.

The CNG control panel is used to regulate the gas flow travelling through the piping system as well as the operating pressure, which can reach up to 250 bar (3600 psi).

WARNING! System pressure should not exceed 3600 psi @ 70° F (21° C).

Main Components of the Control Panel Interface

All the controls and gauges on the control panel interface are easily accessible by opening the control panel access door (see Figure 3-1).

High Pressure Gauge

The high pressure gauge is used to measure the pressurized volume of gas that flows within the first section of the fuel system, that is from the tanks to the regulator.

Low Pressure Gauge

The low pressure gauge is used to measure the pressurized volume of gas that flows within the second section of the fuel system, that is from the regulator to the engine.

Manual Fuel Shut-Off Valve

The manual fuel shut-off valve must be open to let the gas flow between the storage system and the control panel. It must also be open:

- before filling the system;
- to let the CNG fuel go to the engine;

- to purge the CNG system;
- to purge the tubing between the control panel and the cylinders.

The manual fuel shut-off valve must be closed under the following conditions:

- when replacing the coalescing filter;
- when de-fueling;
- to stop CNG gas flow between the cylinders and the control panel;
- when purging piping inside the control panel.

NOTE: Under no circumstances shall the manual shut-off valve be abruptly closed except in an emergency situation.

Fuel Fill Port (Filling Receptacle)

This is through this port that the CNG fuel system of the vehicle is filled with CNG fuel. Supplying natural gas to the fuel system is done by connecting the fueling nozzle to this port.

CAUTION! Before filling the fuel system, always make sure that the truck and the system are adequately grounded.

De-Fueling Port

CNG fuel cylinders may need to be de-fueled for service or maintenance of the cylinders or the fuel system. De-fueling operation is done by connecting the de-fueling nozzle to this port.

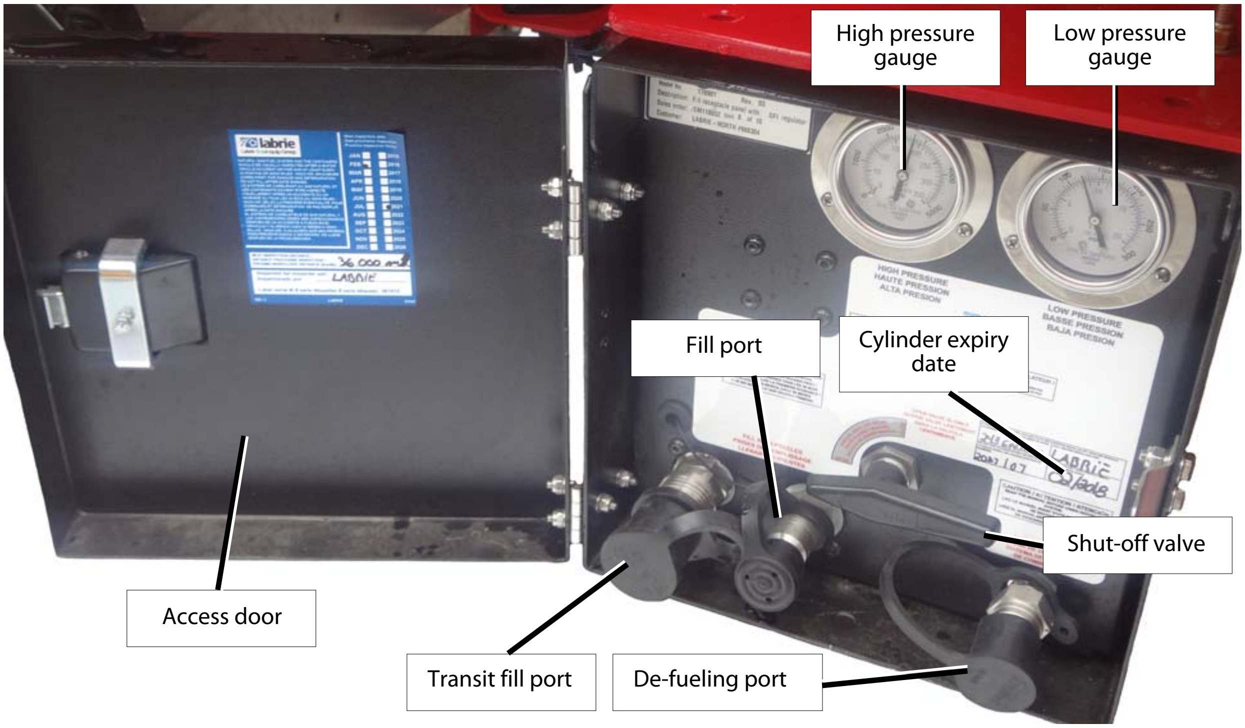
Transit Fill Port (optional)

If installed, this port is used to fill the CNG cylinders at a faster pace to minimize the filling time. The cylinders can be filled at any rate provided that the maximum pressure and temperature are not exceeded (for more information, refer to the CNG fuel system manufacturer's operation manual).

Cylinder Expiry Date

Although CNG cylinders are extremely tough and resistant and are made with durable materials, they have an expiry date. Do not use CNG cylinders if their expiry date is passed. Check this date on the sticker affixed to the control panel interface. Replacement of cylinders is compulsory if the expiry date is reached.

Figure 3-1 Main components - Control panel interface



Main Components Inside the Control Panel

The following illustrations show the main components that are found inside the control panel.

Figure 3-2 Main components - Inside control panel (1)

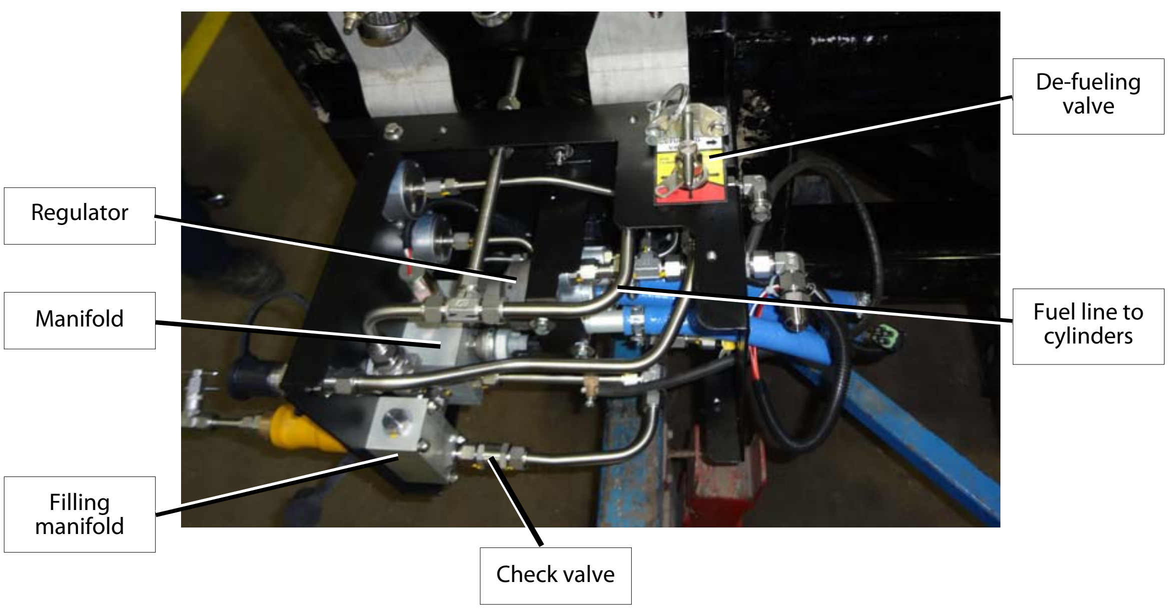


Figure 3-3 Main components - Inside control panel (2)

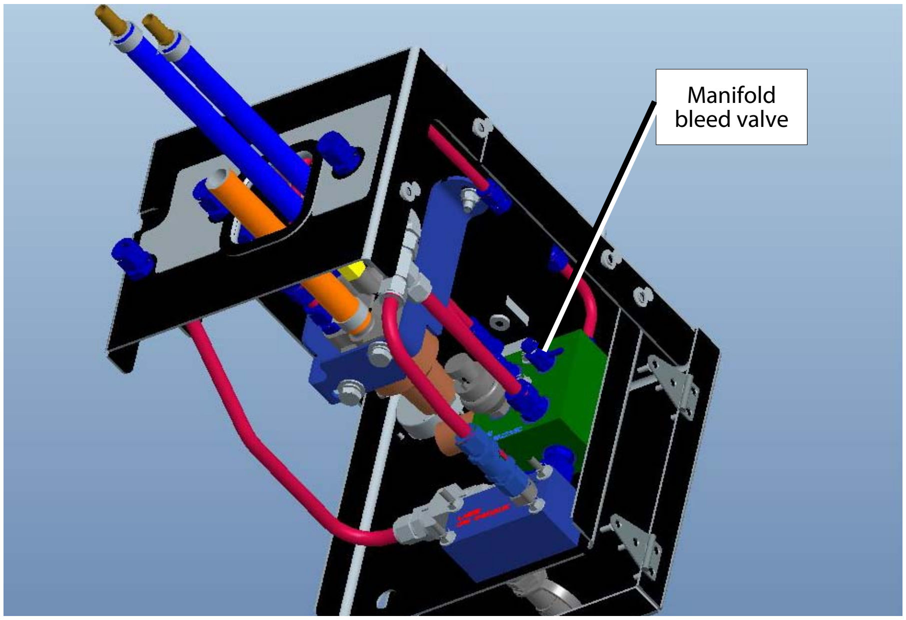
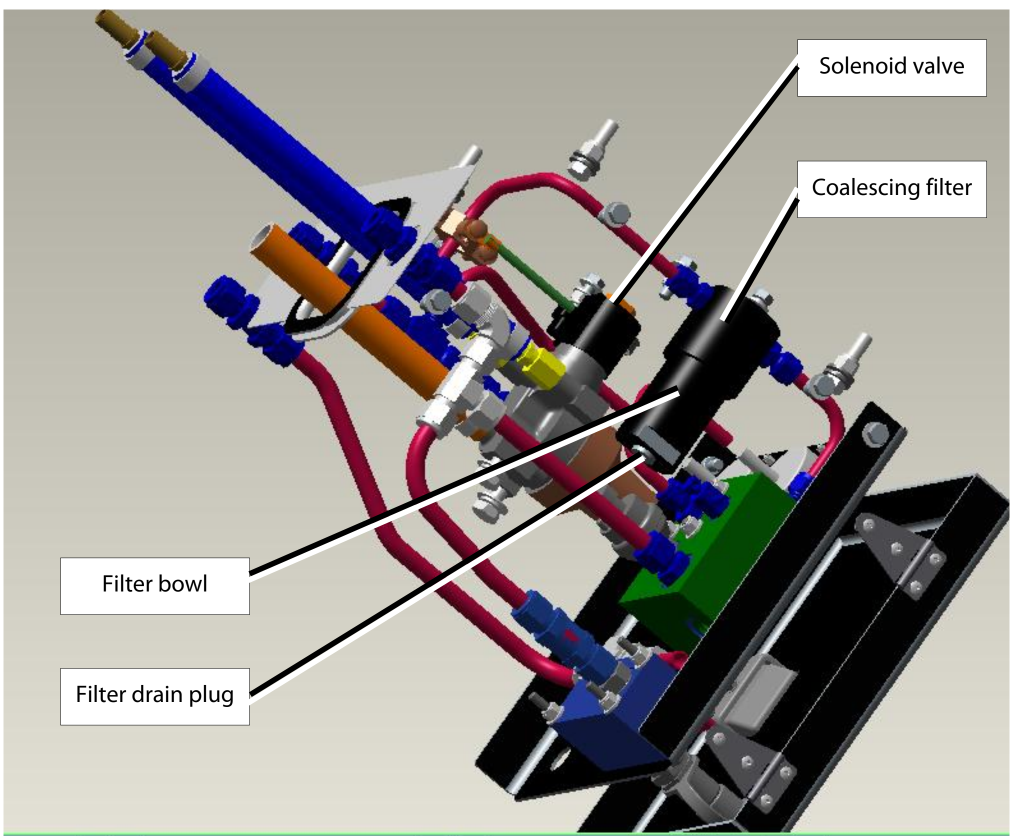


Figure 3-4 Main components - Inside control panel (3)



Manifold

When de-fueling the CNG fuel system or replacing the coalescing filter, the high-pressure side of the manifold should be depressurized using the bleed valve (see Figure 3-3). This valve must be open slowly and gradually until the entire pressure inside the system has been released.

NOTE: The bleed valve is used to depressurize the high-pressure section of the system. It should not be used to empty tanks as it is slow to discharge.

Coalescing Filter

This filter is used to make sure the CNG fuel stays clean (see Figure 3-4). A filter element inside the filter bowl should be drained every 1500 miles (2400 km) and replaced every 3000 miles (4800 km). After replacing the filter element, use a gas leak detector to check for leaks and ensure the connections are bubble-free.

To drain the filter housing, just unscrew the plug at the bottom of the filter bowl. Once the drainage is completed, screw back the plug in place.

If some oil comes out of the filter housing, then the fueling station must be checked.

Solenoid Valve

The solenoid valve must be energized for the fuel system to supply CNG to the engine (see Figure 3-4). Cutting power to the solenoid will stop the flow of CNG from the cylinders. This is useful in an emergency situation. Power to the solenoid is possible via a harness that is connected to it.

Pressure Regulator

This device (see Figure 3-2) is used to regulate pressure inside the CNG fuel system and to maintain a constant upstream pressure of gas despite variations of temperature, pressure and flow conditions.

The regulator may suffer damage due to sudden pressure or flow spikes.

Two ways to protect the pressure regulator:

- during system repressurizing, gas should always be slowly introduced into the tubing;
- engine coolant from the engine cooling system should always pass through the regulator to prevent it from freezing while depressurization occurs in the regulator.

Fuel Line to Cylinders

Gas introduced into the CNG system flows through the fuel line (see Figure 3-2) before reaching cylinders (on the body rooftop or behind the cab).

Check Valve

A check valve (see Figure 3-2) has been added to the CNG fuel system to prevent a reverse flow of gas from occurring should the check valve inside the fueling receptacle fail.

De-Fueling Valve (optional)

CNG systems fitted with an auxiliary de-fuel system are equipped with a de-fueling 3-way valve (see Figure 3-2). With such an option. it is possible to de-fuel the CNG system safely.

Use this valve to remove gas either partly or totally from the CNG system. You may also use it to exhaust gas into the atmosphere (if local authorities permit).

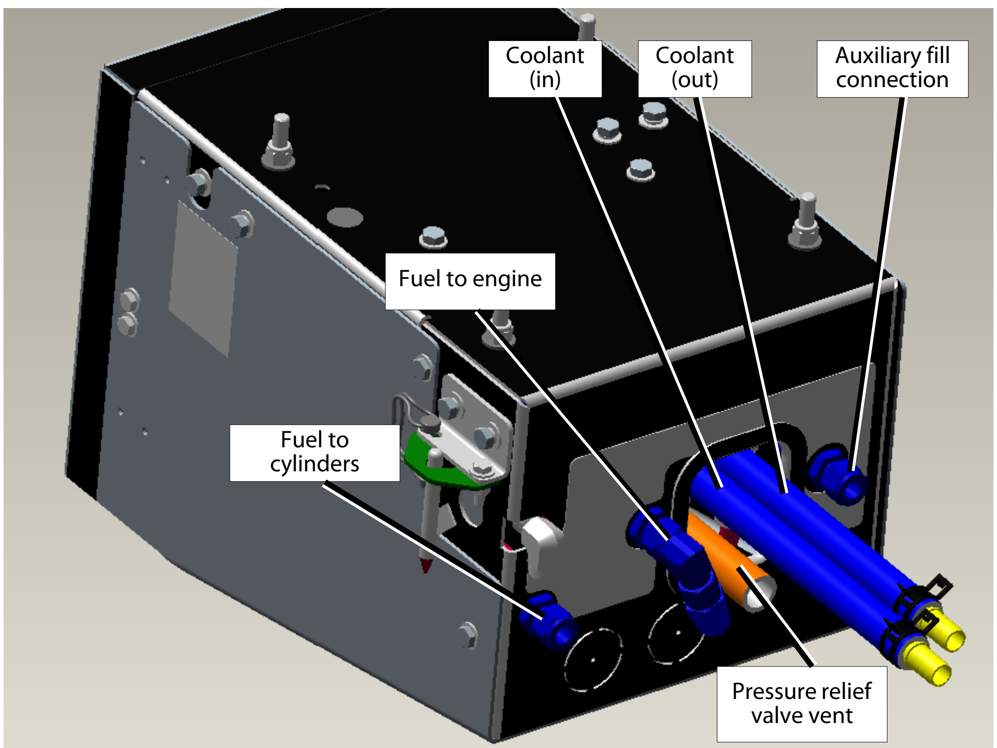
IMPORTANT: Always turn the de-fueling 3-way valve slowly.

This valve has three positions:

- Gas transfer;
- Exhaust;
- Close.

Connections at the Back of the Control Panel

Figure 3-5 Rear connections



Pressure Relief Valve Vent

The regulator is equipped with a pressure relief valve to control the pressure and prevent excessive build up of pressure within the system.

In case of an emergency or a regulator failure, the pressure relief valve may operate, causing pressurized natural gas to exit at the back of the control panel through a vent (see Figure 3-5).

CAUTION! In case of an emergency, stand clear of the pressure relief valve vent as the pressurized gas that comes out of the vent may ignite.

Auxiliary Fill Connection (optional)

This optional feature of the CNG fuel system (see Figure 3-5) is used to connect an auxiliary filling port.

Fuel to Engine Port

The hose that is used to supply fuel to the engine must be connected to this fitting. During installation of the hose, make sure both ends of it are securely tightened down and leak-free.

Fuel to Cylinder Port

The hose that is used to fill cylinders with gas must be connected to this fitting. During installation of the hose, make sure both ends of it are securely tightened down and leak-free.

CAUTION! No attempt should be made to loosen or tighten any connection while the system is pressurized.

Engine Coolant In/Out Hoses

Two hoses through which engine coolant flows are used to protect the pressure regulator from freezing. One of the hoses allows the coolant to enter the control panel while the other allows it to exit from it.

Ground Wire

The CNG fuel system is fitted with a green ground wire (see Figure 3-6 and Figure 3-7). One end of this wire is connected to the fuel system lines. The other end must be properly connected to the chassis of the vehicle. The purpose of the ground wire is to ensure there is no static electricity build-up in the fuel system.

Figure 3-6 Ground wire

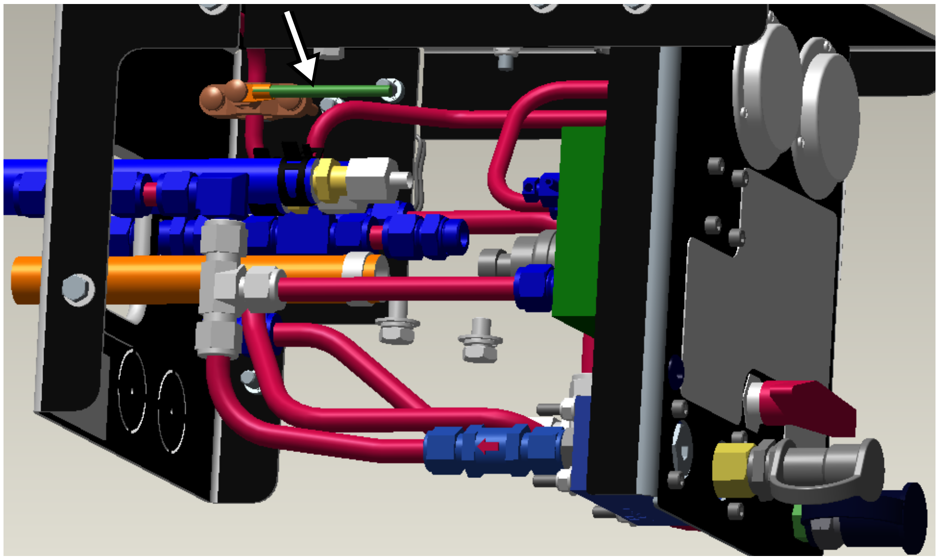


Figure 3-7 Close-up of the ground wire



CAUTION! Make sure the vehicle and the fuel system are correctly grounded before proceeding with filling, de-fueling and operating the CNG system.

Electric Harness

To supply power to the solenoid valve inside the control panel an electric harness (see Figure 3-8) has been installed and connected to this valve. This harness is also connected to the pressure sensor so that it can read the actual flow pressure within the system, and to the pressure switch so that the low pressure light can be activated when the pressure drops below 500 psi.

Figure 3-8 Electric harness



IMPORTANT: Do not expose the control panel to open flames, static electricity, electric spark or other ignition sources. Testing and operating the control panel must be done in a well-ventilated location.

NOTE: Explosion, fire and asphyxiation hazards must be taken into consideration when working with CNG. To minimize these hazards, personnel should always maintain sufficient air circulation and ventilation to prevent dangerous CNG concentrations from forming in the control panel and the working area.

CAUTION! Be careful with the components and tubing that are inside the control panel. Never perform mechanical work on them when they are under pressure.

NOTE: If gas in cylinders and other pressure CNG components is discharged to the atmosphere, the control panel must be purged.

CAUTION! When it comes to CNG, temperature and pressure are two variables of great importance. These variables should be monitored constantly. It is highly recommended not to let control panels be exposed to pressure above 4500 psi or 310 bar and temperature above 150°F or 65°C.

IMPORTANT: It must be stressed that only trained personnel may install and service CNG control panels.

4

CNG System Operation

CAUTION! Proper operation of the CNG fuel system, regular inspection and maintenance must be performed by authorized and trained personnel.

System Operation and Shutdown Modes

The CNG fuel system works normally when the manual cylinder valves and the MANUAL SHUT-OFF valve are in their open position and the solenoid valve is energized via a harness that is connected to it.

Path of the Natural Gas Flow to Power Truck Engine

When the system is energized, CNG gas comes out of the cylinders (located on the rooftop, behind the cab, in the tailgate or along the chassis frame), flows successively at high pressure through the MANUAL SHUT-OFF valve, manifold, coalescing filter, pressure regulator, and finally reaches the engine. See page 3 for a schematic explanation of how the CNG fuel system works.

CNG fuel stops flowing when power to the system is interrupted. However, gas within the tubing remains pressurized unless it is drained.

Starting the Truck

The following is the procedure to be followed in order to properly start a truck powered by natural gas.

To start the natural gas-powered truck:

1. Make sure there is no leak in the CNG fuel system.

   For the leak testing procedure, see *CNG System Testing and Leak Detection* on page 21 of the *CNG Fuel System Supplement (1)*.

2. Check all plastic caps are properly installed on all exposed vent ports to avoid entry of moisture into the system.
3. Make sure all manual cylinder valves and the MANUAL SHUT-OFF valve are in their “OPEN” position.
4. Make sure you also follow the chassis manufacturer’s start-up procedures.
5. Start the engine.
6. Allow the engine to idle for five minutes, particularly if it is the first start of the day, in order to warm up the fuel. This aims at preventing low-pressure lines from freezing up.

   In very cold weather, engine may need to idle for longer periods of time.

Filling and Operating Pressure

Prior to Start-Up

Before you start up the vehicle, turn the MANUAL SHUT-OFF valve, located on the supply control panel interface, to the OPEN position (see Figure 4-1). Check and continue with the daily inspection procedure as outlined in the *Operator’s Manual*. If, during the inspection, smell or vapor of natural gas is detected, report this to the maintenance personnel.

NOTE: Never, under any circumstances, close abruptly the MANUAL SHUT-OFF valve, except in an emergency situation.

Figure 4-1 Manual shut-off valve



DANGER!

Explosion hazard: *Never* try to transfer compressed natural gas from/to another vehicle for refueling, unless both units are equipped with a CNG transfer kit as well as a transfer hose. These items are sold at Labrie. Contact LabriePlus (see page 4) for more information on this.

Low Fuel Pressure Warning Light

Located on the cab console, a red indicator (see Figure 4-2) will light up as the pressure inside gas cylinders is going low. It indicates that the vehicle is running out of gas; the operator should drive to the nearest refueling station to prevent any unwanted shutdown.

Figure 4-2 Low fuel pressure warning light



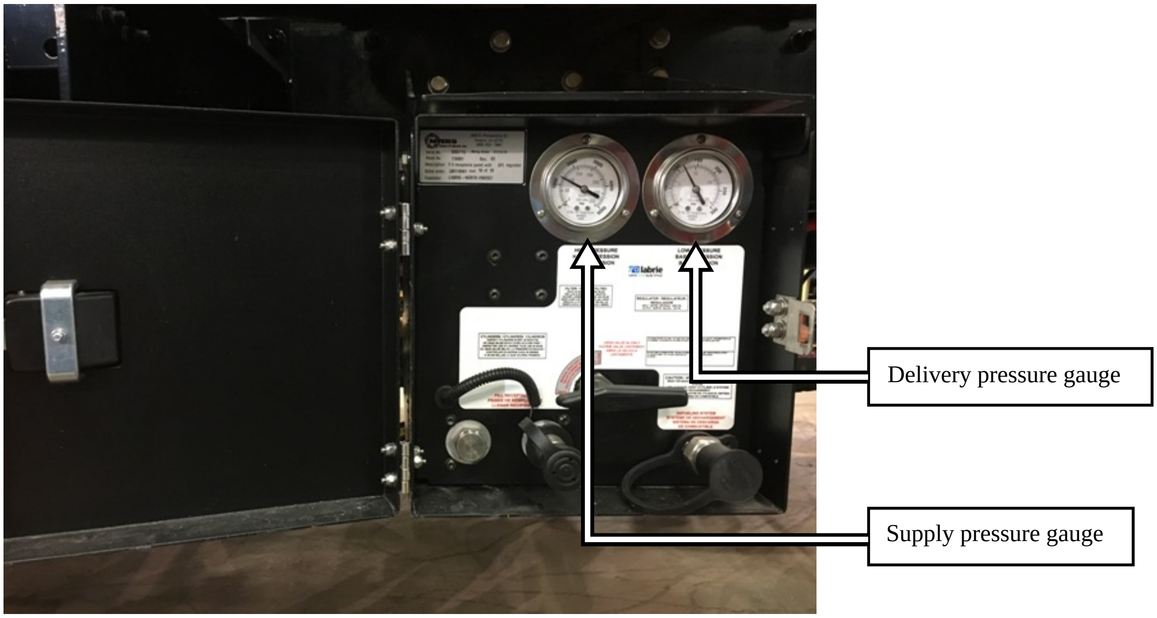
The autonomy of the vehicle, when low pressure warning light is on, depends on how many gas cylinders are installed on the vehicle. Each cylinder should provide approximately 2.5 miles of autonomy. A vehicle with a 4-cylinder bank has an autonomy of about 10 miles.

In case the operator runs out of gas and the engine stops, call a towing service in order to bring back the vehicle to the nearest fueling station. Do not attempt to refill the vehicle without the proper filling equipment.

Gas Cylinder Pressure

To monitor the pressure inside the cylinders, use the pressure gauges on the supply control panel (see Figure 4-3). The left gauge indicates the pressure inside the cylinders and the right gauge indicates the delivery pressure to the engine.

Figure 4-3 Pressure gauges



The pressure indicated on the **left gauge** shall not exceed 3600 psi @ 70° F (21° C)[1].

Note that CNG is sensitive to temperature so that the pressure inside cylinders may vary by hot or cold temperature, which means that the pressure inside fully filled cylinders can reach up to 4500 psi and can also drop.

A pressure drop of 300 psi is not necessary the result of an overnight leak. However, if a major drop of pressure occurs (over 300 psi), see with maintenance personnel to ensure there is no leak in the system and refer to “Emergency Procedures” on page 31.

The pressure indicated on the **right gauge** is not adjustable but a minimum of 65 psi is required to get engine running properly.

DANGER!

Leak detection: Do not start the engine if CNG leak is detected. Refer to “Emergency Procedures” on page 31.

DANGER!

Leak detection: Avoid any open flame or spark close to the vehicle.

1. **The pressure inside cylinders may vary depending on the maximum pressure that the refueling station can provide. Do not exceed 3600 psi @ 70° F (21° C).**

Tubing De-pressurization

For any reason, if de-pressurization occurs, apply the following procedure to re-pressurize the tubing system:

1. Close all manual cylinder valves.
2. Slowly open one manual cylinder valve until gas is heard, then allow the gas slowly pressurize the tubing system.

Also apply this procedure when filling empty high-pressure tubing from the filling port: slowly let gas into the tubing in order to avoid sudden pressure within the regulator.

Emergency Procedures

If a leak is detected apply the following procedure:

1. Shut off the cylinder manual valve.
2. Let the engine kill.
3. Call maintenance personnel or advise your supervisor.
4. The vehicle should be inspected by qualified personnel before restarting the engine.
5. If the vehicle is parked inside a facility, ventilation of the building should be performed.
6. Move the vehicle outside for inspection.
7. See *CNG System Testing and Leak Detection* on page 21 of the *CNG Fuel System Supplement (1)* for leak detection procedure.

If an emergency situation occurs and you need to immediately shut down the CNG system, do the following:

1. Turn OFF the key.
2. If the solenoid fails to return to its closed position, close the MANUAL SHUT-OFF valve (see Figure 4-1).

   Gas will then stop flowing between the storage system and the control panel.

Filling CNG Cylinders

CAUTION! Make sure to follow all safety precautions described in the Safety Section before filling the system with CNG.

When it comes to filling cylinders, there are three options that are available to you:

- Time-fill: Park your truck, fill overnight while the truck is not in service and it will be ready for use the next day.

- Fast fill: This option aims to minimize the filling time. The cylinders can be filled at any rate provided that the maximum pressure and temperature are not exceeded and that applicable standards and regulations are observed.

NOTE: Time needed to fill the tanks varies depending on the capacity of the storage system.

IMPORTANT: The CNG system should not be exposed to pressures above 4500 psi (310 bar) and temperatures above 150° F (65° C) at any time.

- Both: This option enables fast fill during peak periods and time-fill during the night.

WARNING! Do not over-pressure gas cylinders (max. 3600 psi @ 70° F [21° C]).

To fill your natural gas vehicle, drive to the nearest filling station and apply the following procedure:

1. Apply the parking brake.
2. Stop the truck engine.
3. Remove the dust cap from the filling port (see Figure 4-4).

Figure 4-4 Filling port



4. At the dispenser, follow the mandatory safety and filling procedures of the station.
5. Ask for qualified and authorized personnel to fill the vehicle if necessary.

6. Properly ground the CNG system before filling.

CAUTION! Prior to filling the CNG fuel system, always make sure that the vehicle and the system are properly grounded.

---

7. Connect the fueling nozzle to the filling port (see Figure 4-4).
8. Open the MANUAL SHUT-OFF valve (see Figure 4-1).
9. Fill the cylinder until it reaches operating pressure (3600 psi @ 70° F [21° C]) or until the maximum capacity of the dispenser is reached[1]. Most of the filling stations are set to deliver a limited pressure.

IMPORTANT: Each cylinder has an expiry date. When a cylinder reaches its marked expiry date, it cannot be refilled.

10. Do not over-pressure gas cylinders (max. 3600 psi @ 70° F [21° C]).
11. When finished, remove the nozzle and re-install the dust cap on the filling port (see Figure 4-4).
12. Close the access door of the control panel and disconnect the ground wire.

WARNING! Cylinder filling must be performed by QUALIFIED and AUTHORIZED personnel only.

DANGER! Do not exceed 3600 psi @ 70° F (21° C) inside gas cylinders.

WARNING! A portable fire extinguisher must be available at all times on the vehicle and at the filling station.

CAUTION! Before filling the CNG fuel system, make sure that the vehicle and the fuel system are properly grounded.

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1. **The pressure inside the cylinder may vary depending on the maximum pressure the filling station can provide. Do not exceed 3600 psi @ 70° F (21° C).**

Purging

Purging the CNG system of air must be done before filling for the first time. The system must also be purged of CNG before servicing or repairing any component of the system.

CAUTION! The vehicle and the fuel system must be grounded before proceeding with purging operations.

To **purge the fuel system downstream of the cylinders**, proceed this way:

1. Open every manual cylinder valve.
2. Open the MANUAL SHUT-OFF valve.
3. Disconnect the low-pressure fuel supply hose from the engine.
4. Inject the inert gas (Nitrogen) into the system.

   Make use of the fill port on the control panel to do so.
5. Fill the system to at least 220 psi (15 bar).
6. Turn OFF the inert gas supply valve to bring the flow to the cylinders to a standstill.
7. Attach the low-pressure fuel supply hose to an appropriate vent location.
8. Turn ON the power to the solenoid valve. Allow the inert gas to pass through the pressure regulator and exit from the low-pressure fuel supply hose.
9. Bring the system pressure down to 30 psi (2 bar) by letting the air vent, then turn OFF the power supply to the solenoid.
10. Repeat the purge process at least 3 times.

    This is to make sure the air that is left in the system tubing cannot produce a flammable mixture of vapor.

Once this procedure is completed, you can refill the system with CNG or open it to the atmosphere.

CAUTION! If any cylinder or other pressure system component has been opened to the atmosphere, purging the system is required.

NOTE: **Cylinders may have to be purged as well if they were filled with air during a major maintenance or prior to being filled for the first time.**

NOTE: **Purging of the cylinders should be done according to the cylinder manufacturer's procedure. Also, purging must be done before and after maintenance work (before putting the unit back in service).**

The following procedure applies if a tube or a fitting has been opened to the atmosphere during servicing.

To **purge a tube/fitting**, proceed this way:

1. Close the MANUAL SHUT-OFF valve (if purging items inside the control panel only), or close all manual cylinder valves and open the MANUAL SHUT-OFF valve (if purging any tube/fitting between the control panel and the cylinders).
2. Inject the inert gas (Nitrogen) into the tubing through the fill port to a pressure of at least 220 psi (15 bar).
3. Open the manifold bleed valve (see Figure 3-3) and bring the pressure in the tubing down to 30 psi (2 bar).
4. Repeat the purge process at least 3 times.

   This is to make sure the air that is left in the system tubing cannot produce a flammable mixture of vapor.

Cleanliness of System Components

It is really important to keep components of the CNG fuel system as clean as possible to avoid contamination, which is a major cause of regulator failures.

When performing mechanical work on fuel system components, make sure no foreign materials get inside these components or get stuck inside fittings.

The same goes for the tubing. Make sure the outer face of the tubing as well as the inner face are clean and exempt of any foreign materials before (re)installation.

Inspection

Thorough inspections of the CNG fuel system must be carried out on a periodic basis to ensure proper operation of the system, resolve any developing problems within the system and to prevent major problems from occurring.

CAUTION!

Only trained personnel should be assigned to carry out inspections of the CNG fuel system. They must be aware of the dangers of working with high pressure natural gas and must comply with the rules and practices that apply to such inspections. The following procedure is a general guideline. Refer to tank manufacturers, local authorities and/or applicable standards such as CGA 6.4 for further information.

Daily Inspection

Daily inspection must consist of checking pressure relief device (PRD) vent plugs and caps mounted on top of the system. If any of these plugs and caps are missing or displaced, this may indicate a triggered PRD.

NOTE: During inspection, make sure that plugs and caps are conveniently installed in all PRD manifold ports before truck leaves facility in order to avoid entry of moisture into the manifolds.

Inspection After First 2 Weeks of Operation

This inspection should consist of the following:

- Check all connections for torque consistency of the seal.
- Visually check all components for any defects.

Scheduled Inspections Performed at Regular Intervals

These inspections should include the following:

- CNG cylinders must be reinspected every 36 months or 36,000 miles, whichever comes first.
- Check the entire CNG fuel system for any signs of defect such as cracking, dents and abrasion.
- Check all connections for torque consistency of the seal.
- Visually inspect fuel filters. Verify filter elements for any material build-up.
- Visually inspect the pressure regulator.
- Check for minimum clearances that are required between fuel system components and those of the truck.
- Verify electric components to determine if safe and reliable operation is ensured.
- Verify all flow control devices, fittings and tubes.
- Perform a leak test on the entire fuel system using a gas leak detector. See page 21 of the *CNG Fuel System Supplement (1)* for more details.
- Visually inspect the CNG cylinders. Any damage shall be reported and assessed by a qualified CNG fuel system inspector.

CNG Safety and Signaling Decals

Pay careful attention to all safety and signaling decals while working in and around your CNG vehicle. Keep decals clean and in good condition at all times. For replacement, please call Labrie*Plus* (see page 4 for contact information).

The following decals are specific to the use of the CNG fuel system. For all other decals that are found on your Labrie vehicle, refer to the *Operator's Manual* of the particular unit you are using.

Decals inside Cab



32419



47420

159755 - French

84420 - Spanish

Decals on Body



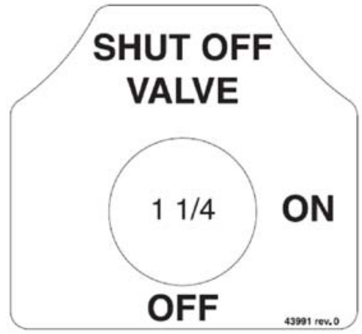
32411



Sticker given as an example. Many stickers like this one are available. Contact Labrie Plus for the sticker pertaining to your truck.



43992



43991

CNG FUELED
VEHICLE

FILLING
PORT

43995

LOW PRESSURE
(Delivery to engine)

43993

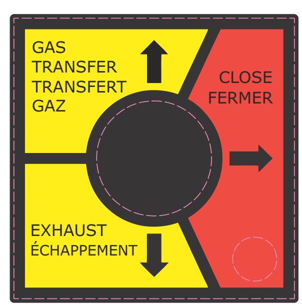
HIGH PRESSURE
(Supply from tanks)

43994

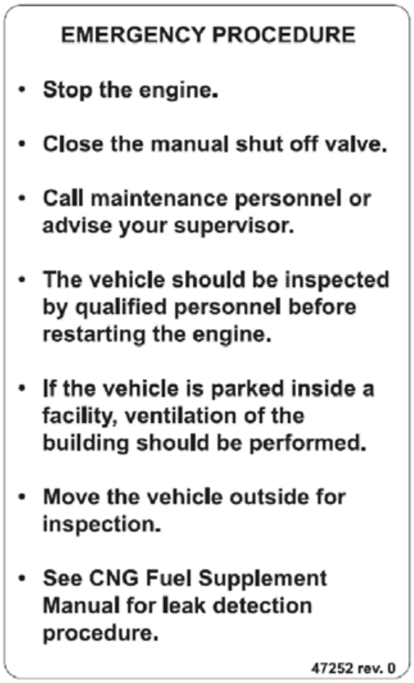
NATURAL GAS

MANUAL
SHUT OFF
VALVE

32416



159853

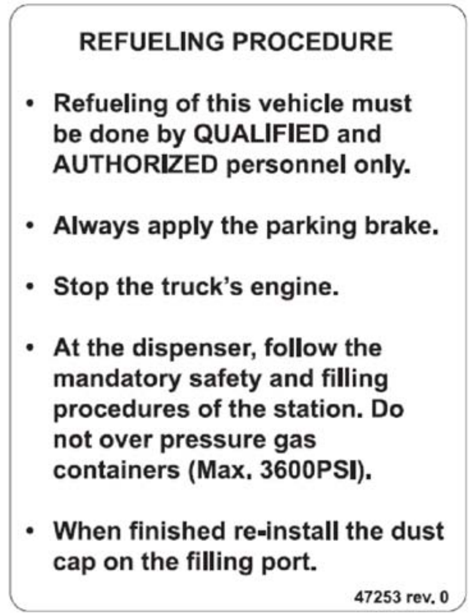


EMERGENCY PROCEDURE

- Stop the engine.
- Close the manual shut off valve.
- Call maintenance personnel or advise your supervisor.
- The vehicle should be inspected by qualified personnel before restarting the engine.
- If the vehicle is parked inside a facility, ventilation of the building should be performed.
- Move the vehicle outside for inspection.
- See CNG Fuel Supplement Manual for leak detection procedure.

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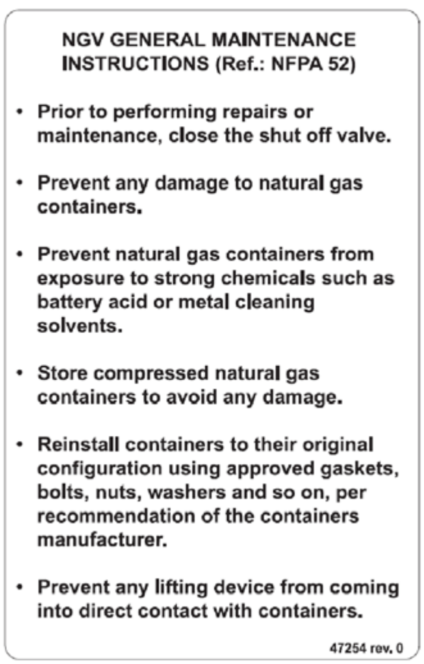


REFUELING PROCEDURE

- Refueling of this vehicle must be done by QUALIFIED and AUTHORIZED personnel only.
- Always apply the parking brake.
- Stop the truck's engine.
- At the dispenser, follow the mandatory safety and filling procedures of the station. Do not over pressure gas containers (Max. 3600PSI).
- When finished re-install the dust cap on the filling port.

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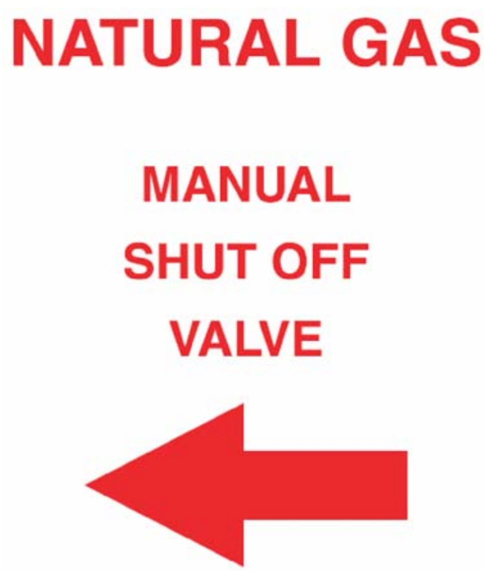


NGV GENERAL MAINTENANCE INSTRUCTIONS (Ref.: NFPA 52)

- Prior to performing repairs or maintenance, close the shut off valve.
- Prevent any damage to natural gas containers.
- Prevent natural gas containers from exposure to strong chemicals such as battery acid or metal cleaning solvents.
- Store compressed natural gas containers to avoid any damage.
- Reinstall containers to their original configuration using approved gaskets, bolts, nuts, washers and so on, per recommendation of the containers manufacturer.
- Prevent any lifting device from coming into direct contact with containers.

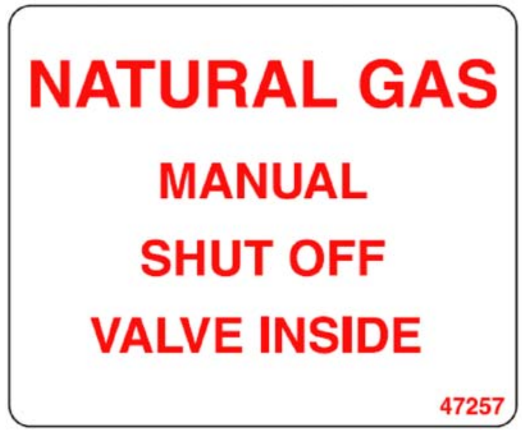
47254 rev. 0

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32415





47256

47257

159761 - French

84419 - Spanish



58680



84376

labrie plus

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Part# 177731 (rev. 0)

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